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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte YUSUKE SUZUKI,
MASAHIRO MOROOKA, and KAZSUHIRO NODA

Appeal 2010-002030
Application 10/527,351
Technology Center 1700

Before BRADLEY R. GARRIS, ADRIENE LEPIANE HANLON, and CHARLES F. WARREN, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1-4, 6, 8-17 in the Office Action mailed February 23, 2009. Appellants subsequently amended these claims in the

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the "MAIL DATE" (paper delivery mode) or the "NOTIFICATION DATE" (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

Amendment filed June 18, 2009, which was entered in the Advisory Action mailed July 6, 2009. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2009).

We affirm the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a photovoltaic element, and is representative of the claims on appeal:

1. A photovoltaic element comprising:

a transparent electrode comprising an ITO substrate and a metallic oxide layer or a derivative layer thereof, the ITO substrate being coated with the metallic oxide layer or derivative layer thereof, the metallic oxide layer or derivative layer being from 10nm to 100nm thick, the transparent electrode having a resistance of about 5 Ω/cm^2; and

a metallic oxide semiconductor layer contacting the metallic oxide layer or derivative layer thereof, the metallic oxide semiconductor layer comprising a light sensitizing dye.

Appellants request consideration of the grounds of rejection under 35 U.S.C. § 103(a) advanced on appeal by the Examiner, stating "[w]hether the rejections of claims 1-4, 6 and 8-17 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Fujimori et al. (US 6,683,244 B2) should be reviewed." App. Br. 6. We thus decide the issues submitted by Appellants with respect to Fujimori alone based on the ground of rejection of claims 1-4, 14, and 17 over Fujimori. Ans. 4. We sustain this rejection for the reasons discussed below.

Appellants did not submit argument with respect to the following grounds of rejection, each ground including at least one reference in addition to Fujimori. Accordingly, we summarily sustain the following grounds of rejection under 35 U.S.C. § 103(a) advanced on appeal by the Examiner: claims 6, 10 and 12 over Fujimori in view of Arakawa (JP 10-92477 A);

claims 8, 9, and 16 over Fujimori in view of Ashida (JP 8-51224 A); claim 11 over Fujimori in view of Arao (US 5,244,509); claim 13 over Fujimori in view of Yamada (US 6,566,162 B2); and, claim 15 over Fujimori in view of Eisenbeiser (US 2003/0015700 A1) and Arao. Ans. 9-16. *See generally* App. Br. *See* Manual of Patent Examining Procedure (MPEP) § 1205.02 (8th ed., Rev. 3, August 2005) ("If a ground of rejection stated by the examiner is not addressed in the appellant's brief, that ground of rejection will be summarily sustained by the Board.").

Appellants argue the claims in the ground of rejection over Fujimori as a group. *See generally* App. Br. Thus, we decide this appeal based on claim 1. 37 C.F.R. § 41.37(c)(1)(vii) (2009).

Opinion

I

The plan language of claim 1, as illustrated in Specification Figure 1, specifies a photovoltaic element comprising at least transparent electrode 3, which comprises an indium-tin oxide (ITO) substrate coated with a metallic oxide layer or a derivative layer thereof; and metallic oxide semiconductor layer 4, comprising a light sensitizing dye and contacting the metallic oxide layer or derivative layer thereof. Spec. 4:14-16. We find Fujimori would have described to one of ordinary skill in this art, as illustrated in Fujimori Figure 2, a photoelectric conversion element comprising electrode 3, which can be an ITO substrate, coated with barrier layer 8, which can be a metallic oxide layer; and electron transport layer 4, which can be a metallic oxide semiconductor layer and is in contact with barrier layer 8, that has light sensitizing dye layer D. Fujimori, e.g., col. 1, ll. 47-50, col. 6, ll. 43-45, col.

7, ll. 11-22, col. 7, l. 57 to col. 8, l. 9, and col. 12, ll. 27-31. Appellants do not dispute the Examiner's finding that the photovoltaic element encompassed by claim 1 and Fujimori's photoelectric conversion element have the same general structure. App. Br., e.g., 7-8.

II

Appellants submit that the Examiner erred in finding that the thickness range of about 0.01 to 10 μm, that is, 10 to 10,000 nm, of metallic oxide barrier layer 8, coated on electrode 3, taught by Fujimori would have rendered obvious the claimed thickness range of from 10 to 100 nm, that is 0.01 to 0.10 μm, of the metallic oxide layer, coated on the ITO substrate of transparent electrode 3, of claim 1.[2] App. Br. 7-8 and 10-11, citing Fujimori col. 12, ll. 22-25. Appellants argue that while the claimed thickness range falls within Fujimori's range, Fujimori's range is too broad to render obvious the much narrower claimed range. App. Br. 10-11. Appellants contend that "Fujimori states that the best results for preventing short circuits are achieved when barrier layer 8 has a thickness between 0.5 μm and 2 μm (i.e., 500 nm to 2000 nm)," and that in Fujimori's Examples, "the thickness of barrier layer 8 is between 0.9 μm and 10.2 μm (i.e., 900 nm to 10,200 nm)." App. Br. 8.

Appellants contend that Fujimori's preferred thickness range of 0.5 to 2 μm, that is 500 to 2000 nm, for the best results for short circuit prevention, falls outside the claimed range, and argue that one of ordinary skill in the art would have been led by Fujimori's specific guidance to select a thickness

within this thickness range for best results. App. Br. 10-11, citing Fujimori col. 12, ll. 22-25. Appellants also contend that Fujimori's broad range of about 0.01 to 10 μm, that is, 10 to 10,000 nm, is one hundred times larger than the claimed range of 10 to 100 nm, that is 0.01 to 0.10 μm, and thus the facts of this case fall within "the Federal Circuit[s] exception for cases in which the prior art's range disclosure is extremely broad" and thus does not render "obvious species within the scope of the genus." App. Br. 10-11, citing *In re Peterson*, 315 F.3d 1325, 1329-30 (Fed. Cir. 2003) (citing *In re Baird*, 16 F.3d 380, 383 (Fed. Cir. 1994)).

We find Fujimori would have taught that barrier layer 8, which can be a metallic oxide layer, prevents short circuits in the disclosed photoelectric conversion element. Fujimori, e.g., col. 7, ll. 57-69, and col. 11, ll. 51-57. Fujimori would have disclosed that the ratio of the thickness of barrier layer 8 to the thickness of electron transport layer 4 is not particularly limited. Fujimori col. 12, ll. 9-21. On this basis, Fujimori would have disclosed that "[m]ore specifically, it is *preferable* that the average thickness (film thickness) of the barrier layer 8 is about 0.01 to 10 μm, *more preferably* about 0.1 to 5 μm, and *even more preferably* about 0.5 to 2 μm." Fujimori col. 12, ll. 22-25 (emphasis added). In these respects, Fujimori would have taught with respect to the disclosed preferable and more limited ranges that "[w]thin this choice it is possible to further enhance the effect described" with respect to the prevention of short-circuiting. Fujimori col. 12, ll. 25-26.

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[2] We agree with Appellants' position that Fujimori would not have anticipated the claimed thickness range of the metallic oxide layer specified in claim 1. *See* App. Br. 9-10; *see generally* Reply Br.

On this record, we cannot agree with Appellants that the Examiner erred in determining that the claimed thickness range of 10 to 100 nm, that is 0.01 to 0.10 μm, of the metallic oxide layer of claim 1 would have been obvious over the *preferable* thickness range of 0.01 to 10 μm, that is, 10 to 10,000 nm, of the corresponding barrier layer 8 taught by Fujimori. Indeed, the lower end of the claimed thickness range coincides within the lower end of Fujimori's *preferable* thickness range, and the upper end of the claimed range overlaps with the lower end of Fujimori's *more preferably* thickness range. Thus, we find that, contrary to Appellants' position, including cited authority, one of ordinary skill in this art would have found in Fujimori the clear teaching that any thickness of barrier layer 8 within Fujimori's preferable range, including the lower end thereof, will work as intended. *Cf., e.g., In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997) ("The statement in Zehender that '[i]n general, the thickness of the protective layer should not be less than about [100 Angstroms]' falls far short of the kind of teaching that would discourage one of ordinary skill in the art from fabricating a protective layer of 100 Angstroms or less.").

Appellants have not adduced objective evidence with respect to whether the claimed thickness range for the metallic oxide layer is critical vis-à-vis the teachings of Fujimori. *See, e.g., Geisler*, 116 F.3d at 1469, and cases cited therein. Appellants contend that they have discovered "the new and unexpected result of preventing the deterioration of ITO during the manufacturing process using a thin metallic oxide layer or derivative thereof having a thickness of 10nm to 100nm" which benefit is not taught by Fujimori. App. Br. 14-15. We find that one of ordinary skill in the art

routinely practicing Fujimori would have formed photoelectric conversion elements in which barrier layer 8 has a thickness at the lower end of the disclosed preferable range and electrode 3 is an ITO substrate, thus falling within claim 1. It is well settled that Appellants' discovery of a new property of Fujimori's photoelectric conversion elements does not render such products again patentable simply because those practicing Fujimori's invention may not have appreciated the property. *See, e.g., In re Spada*, 911 F.2d 705, 707 (Fed. Cir. 1990); *In re Woodruff*, 919 F.2d 1575, 1577 (Fed. Cir. 1990).

III

Appellants submit that the Examiner erred in finding that resistance of Fujimori's electrode 3 and barrier layer 8 would inherently have a resistance of 5 Ω/cm^2 as claimed for transparent electrode 3, comprising ITO coated with an oxide layer, on the basis that the structure of Fujimori's photoelectric conversion elements is the same as the claimed photovoltaic elements encompassed by claim 1, even though Fujimori is silent with respect to resistance. App. Br. 12. Appellants contend that Fujimori's electrode 3 and barrier layer 8 may not necessarily have the claimed resistance because Fujimori teaches that these layers can have different thicknesses "which could cause the resistance value to change significantly." App. Br. 12. Appellants contend that Fujimori discloses a broad thickness range for electrode 3 and barrier layer 8, the use of different materials for barrier layer 8, and a porosity of up to 20% for barrier layer 8, all of which would affect resistance. App. Br. 12. Appellants further contend that Fujimori employs a high temperature process to form electron transport

layer 4 which would raise the resistance of electrode 3 if unprotected by barrier layer 8, and Fujimori does not disclose that barrier layer 8 is capable of such protection. App. Br. 12.

Appellants further contend that the Examiner erred in finding that Fujimori teaches the claimed resistance of 5 Ω/cm^2 for transparent electrode 3 because Fujimori teaches away from the claimed resistance. App. Br. 14-15. "Fujimori states that the resistance in the thickness direction of the barrier layer 8 and the electron transport layer 4 is preferably larger than 100 Ω/cm^2, and more preferably larger than 1k Ω/cm^2." App. Br. 14, citing Fujimori col. 12, ll. 44-55. "Although Fujimori does not specify the resistance of the barrier 8 alone, Fujimori states that the barrier layer preferably has an electric conductivity substantially the same as the electron transport layer 4." App. Br. 14, citing Fujimori col. 2, ll. 31-35.

We disagree with both of Appellants' positions. We agree with the Examiner that Fujimori would have disclosed to one of ordinary skill in this art a photoelectric conversion element comprising an electrode 3, which can be an ITO substrate, coated with barrier layer 8, which can be a metallic oxide layer falling within appealed claim 2; and a metallic oxide semiconductor layer comprising a sensitizing dye 4+D, which falls within the claimed photovoltaic elements encompassed by claim 1. Ans., e.g., 5-6 and 20-25. Fujimori, e.g., col. 7, l. 22, and col. 12, ll. 26-31. We find, in this respect, that Appellants acknowledge that it was known in the art that "as for the electric conductivity, no material that exceeds the ITO [sic] most widely employed as a transparent conductive thin film has been reported. The ITO can realize a very low resistance value as low as, for instance, 5

Ω/cm^2 or less and is inexpensive," providing "high performance inexpensively provided." Spec 3:1-6. We further find that Fujimori prefers that "the barrier layer [8] has electric conductivity which is substantially the same as that of the electron transport layer" 4, and describes titanium dioxide as a preferred material for electron transport semiconductor layer 4 and barrier layer 8. Fujimori, col. 2, ll. 31-33, col. 7, l. 66 to col. 8, l. 12, and col. 12, ll. 35-43. Fujimori discloses that "[a]lthough the resistance in the thickness direction of the barrier layer 8 and the electron transport layer 4 are not limited particularly, it is preferable that the resistance in the thickness direction . . . of a laminate of the barrier layer 8 and the electron transport layer 4 is larger than 100 Ω/cm^2, and more preferably larger than 1k Ω/cm^2." Fujimori col. 12, ll. 44-52. We found above that one of ordinary skill in the art routinely following Fujimori would have reasonably constructed a barrier layer 8 in the thickness range of 0.01 to 0.10 μm, that is 10 to 100 nm. *See above* pp. 5-6.

On this record, the thickness of the barrier metallic oxide layer 8 of Fujimori can be within the claimed metallic oxide thickness range of claim 1. Thus, Fujimori's barrier layer 8 would have the same electric resistance as the claimed metallic oxide layer, and both layers can be formed from the same metallic oxides. Furthermore, one of ordinary skill in the art armed with the knowledge in the art that ITO is an inexpensive, high performance substrate that can have a resistance of 5 Ω/cm^2 or less, would have reasonably selected ITO for electrode 3 from among the materials for this layer disclosed by Fujimori. On the basis that the same and similar materials are used for the same layers of a photovoltaic element in claim 1 and by

Fujimori, we find that it reasonably appears that the claimed photovoltaic elements and the photoelectric conversion elements of Fujimori are identical or substantially identical even though the claimed resistance property of transparent electrode 3 comprising an ITO substrate coated with a metallic oxide layer is not disclosed by Fujimori.

Accordingly, the burden shifted to Appellants to patentably distinguish the claimed photovoltaic elements from the photoelectric conversion elements of Fujimori. *See, e.g., Spada*, 911 F.2d at 708 ("[W]hen the PTO shows sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not."); *In re Best*, 562 F.2d 1252, 1254-56 (CCPA 1977)[3]; *In re Skoner*, 517 F.2d 947, 950-51 (CCPA 1975) ("Appellants have chosen to describe their invention in terms of certain physical characteristics . . . . Merely choosing to describe their invention in this manner does not render patentable their method which is clearly obvious in view of [the reference]." (citation omitted)).

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[3] Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. Whether the rejection is based on "inherency" under 35 U.S.C. § 102, on "prima facie obviousness" under 35 U.S.C. § 103, jointly or alternatively, the burden of proof is the same, and its fairness is evidenced by the PTO's inability to manufacture products or to obtain and compare prior art products.

Best, 562 F.2d at 1255 (footnote and citations omitted).

We are not convinced that Appellants have carried this burden with the argument that Fujimori would have taught away from the claimed resistance because of the disclosure with respect to the resistance of a laminate of barrier layer 8 and electron transport semiconductor layer 4 which exceeds the claimed resistance for transparent electrode 3, comprising an ITO substrate coated with an oxide layer. Indeed, as the Examiner points out, the resistance of the laminate of barrier layer 8 and electron transport semiconductor layer 4 would reside to substantial extent in electron transport semiconductor layer 4. Ans. 25-27. We note in this respect that while Appellants point out that the resistance thus disclosed by Fujimori is based on the thicknesses of the two layers, the thickness of barrier layer 8 can fall within the claimed metallic oxide layer thickness range as we found above. Accordingly, on this record, Appellants' unsupported arguments based on Fujimori's teachings of resistance of the laminate of barrier layer 8 and electron transport semiconductor layer 4 are entitled to little weight. *See, e.g., In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984); *In re Payne*, 606 F.2d 303, 315 (CCPA 1979); *In re Lindner*, 457 F.2d 506, 508 (CCPA 1972).

IV

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in Fujimori with Appellants' countervailing evidence of and argument for nonobviousness and conclude, by a preponderance of the evidence and weight of argument, that the claimed invention encompassed by appealed claims 1-4, 14, and 17 would have been obvious as a matter of law under

35 U.S.C. § 103(a).

The Primary Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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